

D4

(4)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 February 2003 (27.02.2003)

PCT

(10) International Publication Number
WO 03/015537 A1

(51) International Patent Classification: **A23L 1/0524**
1/275

(21) International Application Number: **PA 01/190208819**

(22) International Filing Date: **7 August 2002 (07.08.2002)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:
01119429.7 **13 August 2001 (13.08.2001)** **EP**

(71) Applicant (for all designated States except US): **ROCK III VITAMINS AG** [CH/CH]; 124 Grenzacherstrasse, CH-4070 Basle (CH).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **BECK, Markus**, Ivo [DE/DE]; Am Baselweg 16, 79540 Lengenbach (DE); **KUHNY, Kurt** [CH/CH]; Allmendstrasse 29, CH-4300 Seewen (CH); **LEUENBERGER, Bruno** [CH/CH]; Muehlebachweg 23, CH-4123 Allschwil (CH).

(74) Agent: **MUELLER, Ingrid**; Grenzacherstrasse 124 CH-4070 Basle (CH).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

with international search report
with amended claims

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: COMPOSITIONS COMPRISING SUGAR BEET PECTIN AND CAROTENOIDS

(57) Abstract: Carotenoid compositions for use as colorants or additives for food, beverages, animal feeds, cosmetics or drugs comprise finely dispersed carotenoids in a sugar beet matrix

WO 03/015537 A1

COMPOSITIONS COMPRISING SUGAR BEET PECTIN AND CAROTENOIDS

The present invention relates to novel compositions containing finely dispersed carotenoids and to a process for the preparation of such compositions. The novel compositions of this invention can be used as colorants or additives for food, beverages, animal feeds, cosmetics or drugs.

- 5 More particularly, the present invention relates to novel compositions comprising sugar beet pectin and a carotenoid, to a process for preparing these compositions, their use as a colorant for food, beverages, animal feeds, cosmetics or drugs; and to food, beverages, animal feeds, cosmetics or drugs containing such compositions.

Pectins are basically $\alpha,1 \rightarrow 4$ linked polygalacturonic acids which are partially esterified by methyl groups and which can be obtained from plants such as citrus fruit, apples and sugar beet. The term "sugar beet pectin" as used herein denotes pectins obtainable from sugar beet which are characterized and distinguished from citrus and apple pectins in that secondary hydroxy groups are partially acetylated, and by a lack of gelling properties. While such pectins might also be produced from pears and potatoes the commercially
10 readily available pectins of this type are made from sugar beet, e.g. as GENU Beta Pectin Type BETA from CP Kelco (Copenhagen Pectin A/S, DK-4623 Lille Skensved, Denmark). Thus, the term "sugar beet pectin" is intended to denote all pectins having substantially the properties of pectin obtained from sugar beet and comprises pectins obtained from other sources, e.g., pears and potatoes inasmuch as they have substantially the properties of
15 pectins obtained from sugar beet. For the purpose of the present invention, the sugar beet pectins preferably are those of which a 10 wt.-% aqueous solution has a viscosity of 20 to 10000 mPa·s at 50 °C. The average molecular weight of such pectins is assumed to be in the range of 5 to 150 kDalton although this figure is not to be regarded as crucial in view of the well-known problematics of methodology in determinations of molecular weight.
20

25

The term "carotenoid" as used herein comprises a carotene or structurally related polyene compound which can be used as a colorant for food, beverages, animal feeds, cosmetics or

drugs. Examples of such carotenoids are α - or β -carotene, 8'-apo- β -carotenal, 8'-apo- β -carotenoic acid esters such as the ethyl ester, canthaxanthin, astaxanthin, lycopene, lutein, zeaxanthin or crocetin, or mixtures thereof. The preferred carotenoid is β -carotene.

5 In the compositions of the present invention, the amount of sugar beet pectin is suitably from about 0.5 to about 60.0 wt.-% and the amount of carotenoid is suitably from about 0.1 to about 20.0 wt.-%.

Suitably, the novel compositions of this invention further contain adjuvants and/or excipients such as one or more of a mono- di-, oligo- or polysaccharide, a triglyceride, a water-soluble antioxidant, a fat-soluble antioxidant, silicic acid and water.

10 Examples of mono- and disaccharides which may be present in the compositions of the present invention are saccharose, invert sugar, glucose, fructose, lactose and maltose. Examples of oligo- or polysaccharides which may be present in the compositions of the present invention are starch and starch hydrolysates, such as dextrans and maltodextrins, especially such in the range of 5-65 dextrose equivalents (hereinafter: DE) and glucose.
15 syrup, especially such in the range of 20-95 DE. The term "dextrose equivalent" (DE) denotes the degree of hydrolysis and is measure for the amount of reducing sugar calculated as D-glucose based on dry weight. Native starch has DE close to 0 while glucose has a DE = 100.

The triglyceride is suitably a vegetable oil or fat, such as corn oil, sunflower oil, soybean
20 oil, safflower oil, rape seed oil, arachis oil, palm oil, palm kernel oil, cotton seed oil or cocos oil.

The water-soluble antioxidant may be ascorbic acid and salts thereof, e.g., sodium ascorbate, and the like. The fat-soluble antioxidant may be a tocopherol, e.g., dl- α -tocopherol (i.e., synthetic tocopherol), d- α -tocopherol (i.e., natural tocopherol), β - and γ -
25 tocopherol and mixtures thereof; ascorbic acid esters of fatty acids such as ascorbyl palmitate or stearate; butyl hydroxy toluene; butyl hydroxy anisol; propyl gallate; or t-butyl hydroxy quinoline.

The compositions of the present invention may be an aqueous emulsion (i.e. an oil-in-water dispersion) or a powder.

In one aspect the present invention relates to solid compositions, i.e. stable, water-soluble or dispersible powders. In another aspect, the present inventions relates to liquid compositions, i.e., aqueous colloidal solutions or oil-in-water dispersions of such powders.

Typically, a powder composition according to the present invention comprises

- 5 about 1 to about 60 wt.-% , preferably about 5 to about 30 wt.-% of sugar beet pectin;
 about 0.2 to about 20 wt.-% preferably about 0.5 to about 10 wt.-% of a carotenoid;
 0 to about 70 wt.-% preferably about 0 to about 40 wt.-% of a mono- or
10 disaccharide;
 0 to about 50 wt.-% preferably about 0 to about 35 wt.-% of starch;
 0 to about 70 wt.-% preferably about 0 to about 40 wt.-% of a starch hydrolysate;
 about 0.5 to about 50 wt.-% preferably about 1.5 to about 30 wt.-% of a triglyceride;
15 0 to about 5 % preferably about 0.5 to about 2 wt.-% of a water-soluble anti-oxidant;
 0 to about 5 % preferably about 0.01 to about 2 wt.-% of a fat-soluble anti-oxidant;
 0 to about 2 wt.-% preferably about 1 wt.-% of silicic acid; and
20 0 to about 10 wt.-% preferably about 1 to about 5 wt.-% of water;
the percentages of all ingredients totalling 100.

In accordance with the invention, the novel carotenoid compositions can be prepared by processing the ingredients in a manner known per se for the preparation of water-soluble
25 or dispersible carotenoid compositions. Thus, the compositions can be prepared by a process which comprises homogenizing an aqueous solution or colloidal solution of the pectin and optional water-soluble excipients and adjuvants, a solution or dispersion of the carotenoid and optional fat-soluble adjuvants in a triglyceride and, if required, converting the dispersion obtained into a powder.

30

Typically, sugar beet pectin and optional water-soluble excipients and adjuvants are dissolved in water. The carotenoid and optional fat-soluble excipients and adjuvants are dissolved or suspended in triglyceride. The carotenoid solution (or dispersion) is then added to the aqueous pectin solution with stirring and the mixture is homogenized using

conventional technology, e.g., by high-pressure homogenization, mixing devices as described in EP 1008380-A, high shear emulsification (rotor-stator systems), micronization or wet milling.

- The so-obtained oil-in-water dispersion can be converted into a solid composition, e.g. a dry powder using conventional technology such spray-drying, spray drying in combination with fluidized-bed granulation (the latter technique commonly known as fluidized spray drying or FSD), or by a powder-catch technique where sprayed emulsion droplets are caught in a bed of an absorbant such as starch and subsequently dried.
- 10 The novel compositions of this invention can find use as colorants or vitamin A supplement for food, beverages, animal feeds, cosmetics or drugs. By the present invention there are preferably provided compositions comprising β -carotene as a colouring agent. These compositions, when dissolved, dispersed or diluted in/with water to a final β -carotene concentration of 10 ppm are typically characterized by ultraviolet/visible-
- 15 spectroscopy using deionized water as reference. At a sample thickness of 1 cm the dispersions show an extinction of at least 0.3 (preferably above 1.0) absorbance units at the wavelength of maximum optical density in the range of 400 to 600 nm. This is equivalent to a formal extinction coefficient of β -carotene in aqueous dispersion E(1%, 1cm) of 300 (preferably >1000).

20

The following Examples illustrate the invention further.

Example 1

A dry premix of 80 g of beet pectin (GENU Pectin Type Beta of Copenhagen Pectin A/S; viscosity of a 10 % aqueous solution of the pectin at 50°C around 4000 mPa·s), 160 g of sucrose and 80 g of a maltodextrin (DE 20-23) was prepared. The dry premix was
5 dissolved in 1200 ml of deionized water at 60°C and another 335 g of maltodextrin (DE 20-23) were added. After complete dissolution of the solids 8.0 g of Na-ascorbate was added to the mixture (= solution A).

136 g of a triglyceride (Durkex 500, partly hydrogenated soybean oil of Loders Croklaan B.V.; 1520 AA Wormerveer The Netherlands) and 0.9 g of dl- α -tocopherol were mixed
10 and heated to 140°C. Subsequently, 11 g of β -carotene was suspended in the mixture of triglyceride and tocopherol. By stirring for about 10 minutes at 140°C a clear solution of β -carotene was obtained (= solution B).

Solution A was heated to 70°C and a crude emulsion was prepared by adding 135 g of solution B to solution A while gently stirring. A fine emulsion was obtained by a five
15 passage high pressure homogenizing treatment of the preemulsion at a pressure of 50/300 bar (APV Lab Homogenizer Type Gaulin Lab 40-10 RBEI of APV Switzerland AG, CH-3076 Worb). The emulsion was diluted by adding an equal volume of deionized water at 60°C and then spray dried in a laboratory spray dryer (Mobile Minor of GEA Niro A/S, DK-2860 Søborg) at an inlet temperature of 200°C-210°C and an outlet temperature of 70-
20 75°C. The spray-dried powder was dried in a vacuum oven at room temperature over night.

A fine powder was obtained with a water content of 2.2 %. The β -carotene content of the powder was 1.1 % as determined by spectrophotometry and HPLC-analysis. The powder was dispersed in deionized water and the extinction of the dispersion was measured in a 1
25 cm quartz precision cell against water. For a 10 ppm dispersion of β -carotene an extinction of 2.109 at a wavelength of 464 nm was calculated ($E(1\%,1\text{cm})=2109$)

Example 2

A dry premix of 160 g of beet pectin (Copenhagen Pectin A/S; viscosity of a 10 % aqueous solution of the pectin at 50°C around 500 mPa·s), 160 g of sucrose and 335 g of a
5 maltodextrin (DE 20-23) was prepared. The dry premix was dissolved in 1400 ml of deionized water at 60°C. After complete dissolution of the solids 8.0 g of Na-ascorbate was added to the mixture (= solution A).

136 g of a triglyceride (Durkex 500) and 0.9 g of dl- α -tocopherol were mixed and heated to 140°C. Subsequently, 11 g of β -carotene was suspended in the mixture of triglyceride and
10 tocopherol. By stirring for about 10 minutes at 140°C a clear solution of β -carotene was obtained (= solution B).

Solution A was heated to 70°C and a crude emulsion was prepared by adding 135 g of solution B to solution A while gently stirring. A fine emulsion was obtained by a three
15 passage high pressure homogenizing treatment of the preemulsion at a pressure of 50/300 bar (APV Lab Homogenizer Type Gaulin Lab 40-10 RBFI). The emulsion was diluted by adding an equal volume of deionized water at 60°C and then spray dried in a laboratory spray drier (Mobile Minor of GEA Niro A/S) at an inlet temperature of 200°C-210°C and an outlet temperature of 70-75°C. The spray dried powder was dried in a vacuum oven at room temperature over night.

20 A fine powder was obtained with a water content of 2.5 %. The β -carotene content of the powder was 1.2 % as determined by spectrophotometry and HPLC-analysis. The powder was dispersed in deionized water and the extinction was measured in a 1 cm quartz precision cell against water. For a 10 ppm dispersion of β -carotene an extinction of 2.051 at a wavelength of 463 nm was calculated ($E(1\%,1\text{cm})=2051$).

25 Example 3

A dry premix of 28.6 g beet pectin (GENU Pectin Type Beta of Copenhagen Pectin A/S; viscosity of a 10 % aqueous solution of the pectin at 50°C around 4000 mPa·s) and 121.4 g sucrose was prepared. The dry premix was dissolved in 180 ml of deionized water at 50°C for 30 minutes under stirring (= solution A).

A 30 % suspension of β -carotene in corn oil stabilized by dl- α -tocopherol (β -Carotene 30 % FS of Roche Vitamins) was heated under stirring for about 30 minutes at a temperature of 160°C (= solution B).

5 An emulsion was prepared by adding solution B to solution A. By vigorously stirring for 30 minutes at 50°C a fine emulsion was obtained. The emulsion was diluted by adding 200 ml of deionized water.

300 g of the diluted emulsion were taken and, again, diluted with 50 ml of water. The final emulsion was sprayed into a cooled fluidized bed of corn starch. Excess corn starch was removed by sieving and a coarse powder was obtained. The powder was dried in an air
10 stream at room temperature for about 2 hours.

A powder was obtained with a water content of 6.4 %. The β -carotene content of the powder was 2.5 % as determined by spectrophotometrical assay. The starch content of the powder was 54 %. The powder was dispersed in deionized water and the extinction was measured in a 1 cm quartz precision cell against water. For a 10 ppm dispersion of β -
15 carotene an extinction of 0.401 at a wavelength of 530 nm was calculated ($E(1\%,1\text{cm}) = 401$).

Example 4

Instant beverage powders were prepared according to the following compositions:

Ingredients	# 1 [g]	# 2 [g]
Sucrose, fine crystalline	920.0	920.0
Ascorbic acid, fine powder	2.0	2.0
Citric acid anhydrous, powder	55.0	55.0
Orange flavor ¹	7.0	7.0
Tri-Na citrate anhydrous	6.0	6.0
Tri-Ca phosphate	5.0	5.0

powder according Ex. 1	5.0	-
powder according Ex. 2	-	5.0

¹ e.g. Orange Flavor 76905-71 from Givaudan Duebendorf Ltd

Procedure:

All ingredients were sieved through a 0.7 mm sieve.

- 5 The sieved ingredients were blended in a turbula mixer for 20 minutes

Example 5

Instant pudding powders were prepared according to the following compositions:

Ingredients	# 1 [g]	# 2 [g]
Sucrose, fine crystalline	840.0	840.0
Corn starch, cold swelling	129.0	129.0
Stabilizer ¹	23.0	23.0
Vanilla flavor ²	4.0	4.0
powder according Example 1	4.0	-
powder according Example 2	-	4.0

¹ e.g. Flanogen ADG 56 from SKW Biosystems

- 10 ² e.g. Vanilla flavor 75016-32 from Givaudan Dubendorf Ltd

Procedure:

All ingredients were sieved through a 0.7 mm sieve.

The sieved ingredients were blended in a turbula mixer for 20 min.

What is claimed is:

1. A composition comprising sugar beet pectin and a carotenoid, and, optionally, adjuvants and/or excipients.
2. A composition as in claim 1 wherein the carotenoid is α - or β -carotene, 8'-apo- β -carotenal, 8'-apo- β -carotenoic acid ethyl ester, canthaxanthin, astaxanthin, lycopene, lutein, zeaxanthin or crocetin or mixtures thereof.
3. A composition as in claim 2 wherein the carotenoid is β -carotene.
4. A composition as in any one of claims 1-3 wherein the sugar beet pectin is one of which a 10 wt.-% aqueous solution has a viscosity of 20 to 10000 mPa·s at 50 °C.
5. A composition as in any one of claims 1-4 wherein at least one of a mono- di-, oligo- or polysaccharide, a triglyceride, a water-soluble anti-oxidant, a fat-soluble anti-oxidant, silicic acid and water are additionally present.
6. A composition as in claim 5 wherein the mono- or disaccharide is saccharose, invert sugar, glucose, fructose, lactose or maltose.
7. A composition as in claim 5 wherein the polysaccharide is a starch or a starch hydrolysate.
8. A composition as in claim 7 wherein the starch hydrolysate is a dextrin or a maltodextrin (in the range of 5-65 dextrose equivalents) or a glucose syrup (in the range of 20-95 dextrose equivalents).
9. A composition as in claim 5 wherein the triglyceride is a vegetable oil or fat.
10. A composition as in any one of claims 1-9 wherein the amount of sugar beet pectin is from about 0.5 to about 60.0 wt.-% and the amount of carotenoid is from about 0.1 to about 20.0 wt.-%.
11. A composition as in any one of claims 1-10 which is a powder.

12. A composition as in claim 11 which comprises

- about 1 to about 60 wt.-% of sugar beet pectin;
about 0.2 to about 20 wt.-% of a carotenoid;
5 0 to about 70 wt.-% of a mono- or disaccharide;
0 to about 50 wt.-% of starch;
0 to about 70 wt.-% of a starch or a starch hydrolysate;
about 0.5 to about 50 wt.-% of a triglyceride;
0 to about 5 % of a water-soluble anti-oxidant;
10 0 to about 5 % of a fat-soluble anti-oxidant;
0 to about 2 wt.-% of silicic acid; and
0 to about 10 wt.-% of water.

13. A composition as in any one of claims 1-10 which is an oil-in-water dispersion.

15

14. A composition as in claim 13 which comprises

- about 0.5 to about 30 wt.-% of sugar beet pectin,
about 0.1 to about 10 wt.-% of a carotenoid,
20 0 to about 35 wt.-% of a mono- or disaccharide,
0 to about 35 wt.-% of a starch or a starch hydrolysate,
about 0.25 to about 25 wt.-% of a triglyceride,
0 to about 2.5 % of a water-soluble anti-oxidant,
0 to about 2.5 % of a fat-soluble anti-oxidant, and
25 5 to about 95 wt.-% of water.

15. A composition as in any one of claims 12-14 which when dissolved, dispersed or diluted with/in water to a final β -carotene concentration of 10 ppm has an extinction coefficient $E(1\%, 1\text{cm})$ of ≥ 300 at the extinction maximum.

- 30 16. A process for the preparation of a composition as claimed in any one of claims 1-15 which comprises homogenizing, in an aqueous solution or colloidal solution of the pectin and optional water-soluble excipients and adjuvants, a solution or dispersion of the carotenoid and optional fat-soluble adjuvants in a triglyceride and, if required, converting the dispersion obtained into a powder.

- 11 -

17. The use of a composition as claimed in any one of claims 1-15 as a colorant for food, beverages, animal feeds, cosmetics or drugs.

18. Food, beverages, animal feeds, cosmetics or drugs containing a composition as claimed in any one of claims 1-15.

- 5 19. The invention as particularly described hereinbefore, especially with reference to the Examples.

AMENDED CLAIMS

[received by the International Bureau on 30 January 2003 (30.01.03)
claims 1, 5 amended]

What is claimed is:

1. A composition comprising sugar beet pectin, a triglyceride, a carotenoid and, optionally, adjuvants and/or excipients.
2. A composition as in claim 1 wherein the carotenoid is α - or β -carotene, 8'-apo- β -carotenal, 8'-apo- β -carotenoic acid ethyl ester, canthaxanthin, astaxanthin, lycopene, lutein, zeaxanthin or crocetin or mixtures thereof.
3. A composition as in claim 2 wherein the carotenoid is β -carotene.
4. A composition as in any one of claims 1-3 wherein the sugar beet pectin is one of which a 10 wt.-% aqueous solution has a viscosity of 20 to 10000 mPa·s at 50 °C.
- 10 5. A composition as in any one of claims 1-4 wherein at least one of a mono- di-, oligo- or polysaccharide, a water-soluble anti-oxidant, a fat-soluble anti-oxidant, silicic acid and water are additionally present.
6. A composition as in claim 5 wherein the mono- or disaccharide is saccharose, invert sugar, glucose, fructose, lactose or maltose.
- 15 7. A composition as in claim 5 wherein the polysaccharide is a starch or a starch hydrolysate.
8. A composition as in claim 7 wherein the starch hydrolysate is a dextrin or a maltodextrin (in the range of 5-65 dextrose equivalents) or a glucose syrup (in the range of 20-95 dextrose equivalents).
- 20 9. A composition as in claim 1 wherein the triglyceride is a vegetable oil or fat.
10. A composition as in any one of claims 1-9 wherein the amount of sugar beet pectin is from about 0.5 to about 60.0 wt.-% and the amount of carotenoid is from about 0.1 to about 20.0 wt.-%.
11. A composition as in any one of claims 1-10 which is a powder.

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/EP 02/08819

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23L1/0524 A23L1/275

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, FSTA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00 70967 A (JACOBSEN SOEREN JAN ;CHR HANSEN AS (DK); KENSØE MARTIN (DK); KOEHL) 30 November 2000 (2000-11-30) page 2, line 31 -page 3, line 2; claims 1,7,19,23,29-33 page 3, line 17 -page 4, line 2 page 4, line 14 -page 6, line 35 page 8, line 30 -page 12, line 21 ---	1-11,13, 16-18
X	US 5 008 254 A (WEIBEL MICHAEL K) 16 April 1991 (1991-04-16)	1-3,11, 18
Y	column 4, line 26 - line 30; claims 1,4,9; example 5 ---	1-18
X	WO 00 22939 A (CAMIN HENRY J ;NORTON RICK C (US); TINSLEY JOEL R (US); BASIC AMER) 27 April 2000 (2000-04-27) page 18, line 25 -page 20, line 38 ---	1-3,5-7, 9,13, 16-18
	--- -/--	

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

4 December 2002

Date of mailing of the international search report

27/12/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Baminger, U

INTERNATIONAL SEARCH REPORT

Int. nat. Application No.

PCT/EP 02/08819

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 248 375 B1 (GARLEB KEITH A ET AL) 19 June 2001 (2001-06-19) column 7, line 39 - line 54 column 8, line 26 - line 40 column 9, line 50 - line 62 column 11, line 1 - line 5; claims 1-12; table 10	1-18
A	----- CARLE, R: "Trends in fruit processing" OBST-, GEMÜSE- UND KARTOFFELVERARBEITUNG, vol. 85, no. 3, 2000, pages 125-131, XP009002259 page 129, column 1 -----	

INTERNATIONAL SEARCH REPORT

ional application No.
PCT/EP 02/08819

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 19
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims, it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 19

A lack of clarity of claim 19 within the meaning of Article 6 PCT arises to such an extent as to render a meaningful search of the claims impossible. Consequently, the search has been carried out for those parts of the application which do appear to be clear, namely claims 1-18.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 02/08819

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0070967	A	30-11-2000	AU 4744200 A	12-12-2000
			WO 0070967 A1	30-11-2000
			EP 1178738 A1	13-02-2002
US 5008254	A	16-04-1991	AT 146190 T	15-12-1996
			AU 630755 B2	05-11-1992
			AU 6564190 A	09-05-1991
			CA 2029022 A1	02-05-1991
			DE 69029365 D1	23-01-1997
			DE 69029365 T2	10-04-1997
			DK 426434 T3	30-12-1996
			EP 0426434 A1	08-05-1991
			ES 2098257 T3	01-05-1997
			GR 3022784 T3	30-06-1997
			JP 3197502 A	28-08-1991
			AT 31096 T	15-12-1987
			AU 561116 B2	30-04-1987
			AU 1850583 A	08-03-1984
			BR 8304803 A	10-04-1984
			CA 1228558 A1	27-10-1987
			DE 3374703 D1	07-01-1988
			DK 401583 A ,B,	04-03-1984
			EP 0102829 A1	14-03-1984
			ES 8506839 A1	16-11-1985
			ES 8703555 A1	01-05-1987
			IL 69623 A	30-11-1986
			JP 1914212 C	23-03-1995
			JP 6039482 B	25-05-1994
			JP 59080402 A	09-05-1984
			KR 9103908 B1	15-06-1991
			MX 161464 A	28-09-1990
			US 4923981 A	08-05-1990
			US 4629575 A	16-12-1986
WO 0022939	A	27-04-2000	US 5967783 A	19-10-1999
			AU 1120100 A	08-05-2000
			WO 0022939 A2	27-04-2000
			AU 1122500 A	08-05-2000
			EP 1126793 A1	29-08-2001
			JP 2002527188 T	27-08-2002
			WO 0023003 A1	27-04-2000
			US 6234797 B1	22-05-2001
			US 2001055744 A1	27-12-2001
US 6248375	B1	19-06-2001	AU 4145001 A	24-09-2001
			BR 0107098 A	11-06-2002
			WO 0167889 A1	20-09-2001